

can be at once distinguished by its dark apex. *Type*: U. S. N. M. No. 313702; Calamintao, Mamburo, Mindoro.

Cochlostyla (Chrysallis) aspersa juani, new subspecies. This is the smallest of the short based subspecies. *Type*: U. S. N. M. No. 313708; Camorong, Abra de Ilog, northern Mindoro.

COCHLOSTYLA (CHRYSALLIS) ASPERSA MINDOROENSIS Broderip. Dulugan, Puerto Galera, northeastern Mindoro.

COCHLOSTYLA (CHRYSALLIS) ASPERSA MELANOGASTER Mörch. Mt. Sapol northeastern Mindoro.

COCHLOSTYLA (CHRYSALLIS) ASPERSA WAGNERI Grateloup. About Lake Naujan, eastern Mindoro.

Cochlostyla (Chrysallis) aspersa edgari, new subspecies. This is the large, elongate-ovate race with rather protracted base about the east slope of Mt. Halcon. The axial bands of brown and buff are distinct and rather broad, and not interrupted at the periphery. *Type*: U. S. N. M. No. 313712.

Cochlostyla (Chrysallis) aspersa binuangana, new subspecies. This subspecies is very dark colored and of ovate form. It suggests *Cochlostyla (Chrysallis) aspersa melanogaster* but lacks the dark basal coloration. *Type*: U. S. N. M. No. 313713; Binuanga, Paluan, northwestern Mindoro.

Cochlostyla (Chrysallis) aspersa ilogana, new subspecies. This subspecies is readily distinguished from *Cochlostyla (Chrysallis) aspersa edgari* by its much more regular elongate-ovate form and from *Cochlostyla (Chrysallis) aspersa calavitana* by its much greater size. *Type*: U. S. N. M. No. 313706; Camorong, Abra de Ilog, northern Mindoro.

Cochlostyla (Chrysallis) aspersa calavitana, new subspecies. This subspecies can readily be distinguished from the other members of the group with protracted base by its exceedingly small size. *Type*: U. S. N. M. No. 313714; Mt. Calavite near Paluan, northwestern Mindoro.

Cochlostyla (Chrysallis) caniceps, new species. In this species the shell varies from elongate-ovate to elongate-conic. The nuclear whorls are flesh colored. Postnuclear whorls marked by axial bands and fulgurations of yellow or greenish yellow. Interior of aperture bluish white; peristome varying from white to brown in the different subspecies. Distribution apparently all over Mindoro, breaking up into a number of subspecies.

Cochlostyla (Chrysallis) caniceps demesai, new subspecies. This subspecies is much darker than any of the other subspecies. Here the dark color of the peristome extends within the aperture, a feature not possessed by the other races. *Type*: U. S. N. M. No. 313552; Calamintao, Mamburo, northwestern Mindoro.

Cochlostyla (Chrysallis) caniceps maita, new subspecies. This subspecies belongs to the ovate-conic group and most nearly resembles *Cochlostyla (Chrysallis) caniceps contracostana*, but it is much larger and the peristome is much darker. *Type*: U. S. N. M. No. 20351a; southern tip of Mindoro.

Cochlostyla (Chrysallis) caniceps contracostana, new subspecies. This subspecies belongs to the elongate-ovate group and can readily be distinguished from *Cochlostyla (Chrysallis) caniceps demesai* by its smaller size and less brilliant coloration, and from *Cochlostyla (Chrysallis) caniceps maita* by its smaller size. *Type*: U. S. N. M. No. 313554; Contra Costa, Mindoro.

Cochlostyla (Chrysallis) caniceps conica, new subspecies. The regularly conic outline will distinguish this subspecies from all the others. *Type*: U. S. N. M. No. 313555; southwestern Mindoro.

Cochlostyla (Chrysallis) caniceps caniceps, new subspecies. In this subspecies the shell is elongate-conic; the whorls are well rounded. It is nearest related to *Cochlostyla (Chrysallis) caniceps minuta*, but is much larger than that subspecies. *Type*: U. S. N. M. No. 313556; Lake Naujan, Mindoro.

Cochlostyla (Chrysallis) caniceps minuta, new subspecies. This subspecies is most nearly related to the typical race *Cochlostyla (Chrysallis) caniceps caniceps*, but is easily distinguished from it by its smaller size and more shaggy sculpture. *Type*: U. S. N. M. No. 313560; Mansalay, southeastern Mindoro.

Cochlostyla (Chrysallis) nigriceps, new species. The members of this species closely resemble *Cochlostyla (Chrysallis) caniceps* from which, however, they can be distinguished at once by their dark nuclear turns.

Cochlostyla (Chrysallis) nigriceps nigriceps, new subspecies. This subspecies is nearest related to *Cochlostyla (Chrysallis) nigriceps nubifer*, from which it is distinguished by its lesser size. *Type*: U. S. N. M. No. 313716; Lake Naujan, northeastern Mindoro.

Cochlostyla (Chrysallis) nigriceps nubifer, new subspecies. This subspecies is nearest related to *Cochlostyla (Chrysallis) nigriceps nigriceps*, from which its larger size will readily distinguish it. *Type*: U. S. N. M. No. 195408; southwestern Mindoro.

Cochlostyla (Chrysallis) nigriceps obnubila, new subspecies. This subspecies is readily distinguished from the other two by having the general color blackish brown instead of chestnut brown. The hydrophanous cloudings are also lighter and much more pronounced. *Type*: U. S. N. M. No. 313718; Binuangan, Paluan, northwestern Mindoro.

Cochlostyla (Chrysallis) perturbator, new species. Shell of medium size, ovate. Early nuclear whorls white, grading slowly into the brown of the postnuclear turns. Periostracum of the postnuclear whorls moderately thick, covered by hydrophanous bands, cloudings or fulgurations of olivaceous buff between which the dark ground color shines through. On the last whorl the periostracum is almost completely hydrophanous. Interior of the broadly oval aperture pale blue; periostracum and inner lip chocolate brown, with an iridescent flush. *Type*: U. S. N. M. No. 313720; Tara, Abra de Ilog, northern Mindoro.

Cochlostyla (Chrysallis) corrugata, new species. In this species the nuclear

whorls are flesh colored; the early postnuclear whorls are buff, while the later ones gradually range to very dark chestnut brown. The postnuclear whorls are conspicuously marked by brilliant fulgurations of yellowish buff, which are most pronounced near the summit of the shells. The interior of the aperture and inner portion of the columella are pale blue, gradually grading to purplish brown at the edge of the expanded peristome and inner lip. The most distinctive feature of the shell, however, is the axial corrugations of the last, and sometimes the penultimate, whorl. *Type*: U. S. N. M. No. 313740; San Jose, southwestern Mindoro.

ZOOLOGY.—*Metoncholaimus pristiurus* (zur Strassen); a nema suitable for use in laboratory courses in zoology.¹ N. A. COBB, U. S. Department of Agriculture.

Zur Strassen, who first proposed the species *Metoncholaimus pristiurus*, alluded for the most part only to the organs whose forms served to distinguish it from its nearest allies among the oncholaims. The present attempt at a more complete understanding of its morphology adds to our knowledge in a number of ways, especially with regard to the remarkable demanian system.

At the same time the text and figures have been prepared with particular reference to requests of school, college and university instructors in invertebrate zoology, a course suggested by the fact that this species has been used with some promise of success in the invertebrate courses of a considerable number of universities.

Unfortunately few if any zoological textbooks treat nemas adequately. It is believed that any progressive and well equipped instructor who will study carefully the following descriptions, with the aid of good *living* as well as preserved specimens, will find himself all the better equipped to instruct students concerning the morphology of the important nemic phylum.

METONCHOLAIMUS PRISTIURUS (Zur Strassen)

[*Meta*, changed; *Oncholaimus*, tooth (in the) throat]

FEMALE. Fig. 1.

The cuticle and the body wall. $\frac{0.8}{0.8} \dots \frac{5.9}{1.3} \dots \frac{13}{14} \dots \frac{51.65}{1.5} \dots \frac{96.2}{0.7} \dots 5.6\text{mm}$
The contour of the nema is plain. The thin, transparent, colorless, nearly naked cuticle, 72, 96, about one micron thick, is traversed by plain transverse striae; but these are very difficult of resolution except with high powers of the microscope used skillfully under favorable conditions,—ordinarily they will

¹ Through the much appreciated courtesy of the United States Bureau of Fisheries a considerable part of these investigations was carried out at its Laboratories at Woods Hole, Mass. Received May 18, 1932.

not be seen. These striae are not altered on the lateral fields; there are no longitudinal wings. The subcuticle, 99, usually contains multitudinous pebbly,—i.e. roundish or slightly elongate,—*yellowish pigment granules*, 34, 82, 95, one to two microns across, “paved” in longitudinal bands of variable width;—two broad lateral bands, one on each side of the body, about one-third as wide as the nema and having narrower submedian bands on each side; and three narrow ventral bands as well as even narrower dorsal bands. These bands are better seen after staining over night in *seawater-methylene-blue*, which may not only stain them but bring out the fact that the granules along the edges of the two main lateral bands are of a somewhat different nature from the rest. *Longitudinal striations* in the subcuticle, due to the attachment of the musculature, 4, 16, 77, are faintly visible at high magnification in most regions of the body, especially the more translucent parts. The body wall, including the cuticle, is about six microns thick.

Ten widely spreading *cephalic setae*, 26, are arranged on the lateral surface of the lip region in the usual way, i.e. a pair on each submedian line and one on each lateral line; the longest of these are one-fourth as long as the corresponding portion of the head is wide, the shorter member of each submedian pair being about three-fourths as long as the longer. The members of the submedian pairs grow so close together as sometimes to appear as one. These subcylindroid setae are nearly straight and are blunt at the end, where they seem more or less *open*, not closed, indicating, probably, that they may also be connected with some sense in addition to that of touch. There are a few scattered subcephalic setae near the head, of nearly the same length (ten to twelve microns) as the cephalic setae, but more slender. On the neck and on the body there are also a few scattered setae,—very inconspicuous and seldom seen. There are also a few very short, *very inconspicuous setae* on the tail, especially toward its extremity and *on the spinneret*, 24, 74. There are no cuticular pores.

The neck and head. The head and neck occupy the anterior 11 to 13 per cent of the body, i.e. the part in front of the prominent constriction, 13, between the nearly colorless oesophagus, 12, 36, and the darker intestine, 83, 94. The slightly conoid *neck* ends in a *subtruncate continuous head*, the frontal mouth opening in which is not depressed. In front the *pharynx*, 31, 48, 57, is arched over by the six distinct and separate, flat and thin, fairly well developed, mobile *lips*, 28, 49, which are not set off by constriction or in any other way. As a rule the lips are not readily counted except when seen from in front. Toward the margin of the head there is a circlet of six, innervated, very minute and inconspicuous, *forward-facing sensory papillae*, 29, 45, one on each lip. This circlet is about two-thirds as wide as the front of the head. These papillae also are rather difficult to see except from in front, 45. The rather simple subregular *pharynx*, 31, 35, 48, 57, about forty by twenty-three microns, is somewhat cylindroid anteriorly and vaguely conoid posteriorly. The *posterior “chamber,”* 35, sixteen by nine microns, supports the *three acute onchia*, 25, 33, 53, the forward pointing projection of the largest of which is very readily seen. Taken as a whole the pharyngeal cavity might be described as somewhat convex-conoid. Its refractive, cuticularized wall is nearly two microns thick.

Its armature consists of three unequal, conoid, perforated, pointed onchia, *one dorsal*, 25, *two ventrally submedian*, 33, 53. Of these the grooved left ventral submedian, 27, 53, is much the largest, and reaches two-thirds the distance to the lips. The other two, *e.g.* 33, 25, nearly equal in size, reach only about halfway to the lips. Each onchium is the outlet of a branched and

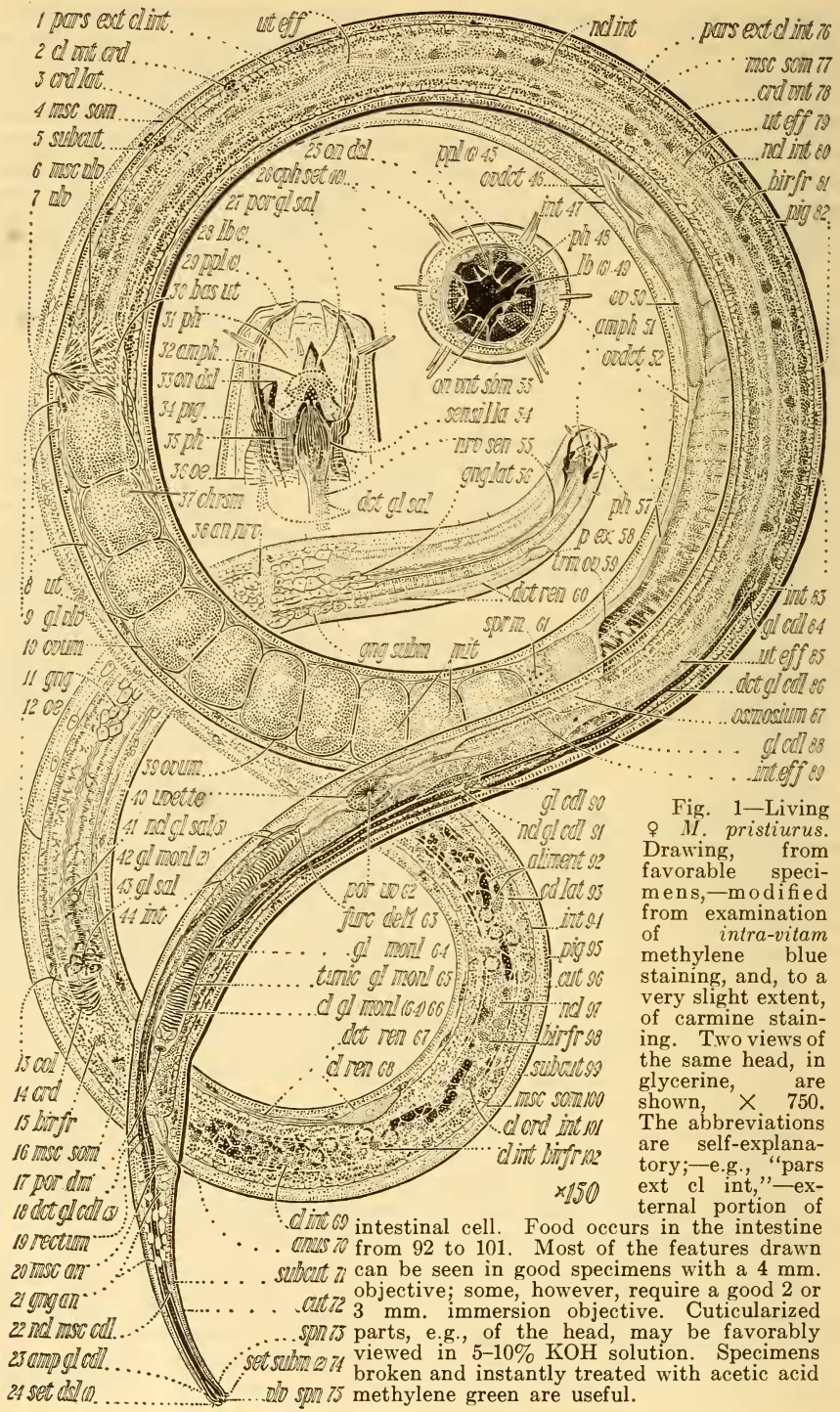


Fig. 1—Living ♀ *M. pristiurus*. Drawing, from favorable specimens,—modified from examination of *intra-vitam* methylene blue staining, and, to a very slight extent, of carmine staining. Two views of the same head, in glycerine, are shown, $\times 750$. The abbreviations are self-explanatory;—e.g., "pars ext cl int,"—external portion of intestinal cell. Food occurs in the intestine from 92 to 101. Most of the features drawn can be seen in good specimens with a 4 mm. objective; some, however, require a good 2 or 3 mm. immersion objective. Cuticularized parts, e.g., of the head, may be favorably viewed in 5-10% KOH solution. Specimens broken and instantly treated with acetic acid methylene green are useful.

- 1 pars ext cl int.
- 2 cl int crd
- 3 crd lat.
- 4 msc som
- 5 subcut.
- 6 msc ub
- 7 ub
- 8 ut.
- 9 gl ob
- 10 ovum
- 11 gng
- 12 oe
- 13 col
- 14 crd
- 15 bir fr
- 16 msc som
- 17 per dnt
- 18 det gl cdl
- 19 rectum
- 20 msc an
- 21 gng an
- 22 ncl msc cdl.
- 23 amp gl cdl.
- 24 set dal

- ut eff
- 25 on dal
- 26 coh set
- 27 por gl sal
- 28 lb e
- 29 ppl o
- 30 bas ut
- 31 ph
- 32 amph
- 33 on dal
- 34 pig
- 35 ph
- 36 oe
- 37 chrom
- 38 an nre
- 39 ovum
- 40 uette
- 41 ncl gl sal
- 42 gl mont
- 43 gl sal
- 44 int
- 45 int c69
- 46 anus
- 47 subcut
- 48 cut
- 49 spn
- 50 set subm
- 51 ub
- 52 spn
- 53 ncl int
- 54 pars ext cl int
- 55 msc som
- 56 crd int
- 57 ut eff
- 58 ncl int
- 59 bir fr
- 60 pig
- 61 int
- 62 ph
- 63 lb e
- 64 ov
- 65 amph
- 66 oodet
- 67 on int som
- 68 sensilla
- 69 nro sen
- 70 gng lat
- 71 det gl sal
- 72 dot ren
- 73 spr m
- 74 gng subm
- 75 mit
- 76 ph
- 77 p ex
- 78 tm oe
- 79 dot ren
- 80 int
- 81 gl cdl
- 82 ut eff
- 83 det gl cdl
- 84 oosmium
- 85 gl cdl
- 86 int eff
- 87 gl cdl
- 88 int eff
- 89 gl cdl
- 90 ncl gl cdl
- 91 aliment
- 92 cd lat
- 93 int
- 94 pig
- 95 cut
- 96 ncl
- 97 bir fr
- 98 subcut
- 99 msc som
- 100 cl ord
- 101 int
- 102 cl int bir fr

- ppl o 45
- oodet 46
- int 47
- ph 48
- lb e 49
- ov 50
- amph 51
- oodet 52
- on int som 53
- sensilla 54
- nro sen 55
- gng lat 56
- ph 57
- p ex 58
- tm oe 59
- dot ren 60
- spr m 61
- gng subm 62
- mit 63
- ph 64
- p ex 65
- tm oe 66
- dot ren 67
- int 68
- gl cdl 69
- ut eff 70
- det gl cdl 71
- oosmium 72
- gl cdl 73
- int eff 74

much elongated *unicellular salivary gland*, *e.g.* 43, and *dct gl sal*, located along the corresponding sector of the oesophagus and reaching back even to near the base of the neck, where the corresponding three nuclei, 41, may be seen, about one body-width in front of the prominent constriction, 13, separating the oesophagus from the intestine. Each gland empties through a perforation, 27, in the corresponding onchium, by means of an inconspicuous *ampulla* and a *very fine duct*,—about one micron across. The distribution of the salivary glands among the radial contractile fibers of the oesophagus may be indicated by the granules, one micron or less in diameter, to be seen in various parts of the glands, *e.g.* at *dct gl sal*. In favorable specimens the ducts of these glands, when filled with this granular secretion, can be followed throughout the length of the oesophagus, and the glands are then seen to have numerous short lateral branches, (see from 43 forward). The much larger, though inconspicuous *pigment granules of the oesophagus* are scattered throughout the organ.

The external *amphids*, 32, 51,—one on each side of the head,—are somewhat escutcheon shaped, being symmetrical only to a longitudinal line, and are longer transversely than longitudinally. The anterior border of each amphid is removed from the anterior extremity of the nema a distance about equal to the radius of the head. They are much more obvious if looked at dorso-ventrally, when they are distinctly seen to be two pocket-like entrances to internal sensory organs, the internal amphids, located laterad in the back part of the head. Each of the external amphids is about one-fourth as wide as the corresponding portion of the head and about two-thirds as long as it is wide. Each outer amphid connects with a *sensilla*, 54, or *receptor*, close behind, by means of an exceedingly narrow and very short (two and a half microns) but strongly refractive, duct, shown in the figure. The sensilla is one-fifth as wide as the head and lies opposite the basal part of the pharynx and is connected backward with the central nervous system by a lateral nerve, 55, just beneath the body wall. The details of the sensilla, 54, are usually difficult to see except when specially stained. The amphids are held to be chemical sense organs.

The *oesophagus*, 12, 36, is cylindroid, enlarging very slightly posteriorly; behind the pharynx it is three-fifths, at the nerve-ring one-half, and finally two-thirds as wide as the corresponding portion of the neck. The refractive membranous “triquetrous” *lining of the oesophagus*, mainly about one micron thick, but two microns in the axial parts, is a distinct feature throughout the organ, and finds *main optical expression* in what appear as two or three closely approximated refractive, often slightly sinuous, axial elements, and, in the ordinary closed condition of the oesophagus, seeming to occupy about one-eighth of its width. The radial *musculature of the oesophagus*, to be seen throughout its length, consists of fine strands and is accompanied by only a slight amount of yellowish granular matter. There are no cuticularized valves in the oesophagus.

The intestine. The *intestine*, 83, 94, which becomes at once two-thirds as wide as the body, is thick-walled and is composed, as is usual in nemas, of a *single layer of cells*, 69 and vicinity, here of such a size that about twelve are required to complete the circumference. The walls of the cells are only faintly visible except sometimes in the outer colorless part, 1, 76. Usually the lumen of the intestine, (see just behind cardia, 14) can be seen only faintly, since the lining of the intestine is not refractive. As the nema bends back and forth, the food content of the intestine, *e.g.* at 92, may be seen to move backward and forward in the lumen. This nema appears to swallow mud

rather indiscriminately, and to extract its nutriment from a variety of organic material contained in the mud. Large quantities of this food material in the intestine may interfere with microscopic examination; hence the advisability of keeping the nemas in clean cool seawater for a day or two before examination. The *cardiac collum*, or constriction, 13, between the oesophagus and intestine, is about two-fifths as wide as the base of the neck, making a very obvious demarcation between the oesophagus and the intestine. There is a conoid *cardia*, 14, about two-fifths as wide as the base of the neck; this is the very short extension of the oesophagus into the intestine, and is composed of numerous smaller cells of a distinct kind, having to do, among other things, with the prevention of regurgitation. Though small, the *cardia* is a very important part of the alimentary canal. The outer portion of the intestine, 1, 76, is usually more or less *destitute of granules*, but the inner and greater portion of each intestinal cell contains globular yellowish *granules*, 69, of variable size, the largest of which are about three microns in diameter, and the smallest less than one micron. These granules are varied and numerous, sometimes are even packed close together, and may be so arranged in the cells as to give rise to a faint, or sometimes a quite distinct, tessellated effect.

The intestine is made up of *cells of different kinds*,—discharging different functions. One of these various kinds is readily made out, especially with the aid of polarized light, namely the cells, as many as one hundred in number or even more, containing the exceedingly minute *birefringent granules*. These cells, 15, 81, 98, when examined by ordinary transmitted light, present a finer texture internally, and usually are more distinctly yellowish. If a suitable specimen be allowed to remain in a concentrated solution of seawater-methylene-blue a few minutes, a differential staining of the “birefringent” cells will often occur, but the effect does not last. The “birefringent” cells are everywhere less numerous than those that do not contain birefringents, and there are *none of them at all* in the posterior part of the intestine. We may therefore speak of two distinct intestinal regions, one fore, one aft. The “birefringent” cells occur in early ovic embryos.

The rather prominent short *rectum*, 19, the rear part of the intestine, is somewhat cuticularized, and is about as long as the anal body diameter; from the somewhat depressed *anus*, 70, it extends inward and forward at an angle of about forty-five degrees. Its structure in the female differs somewhat from that of the male, which appears “helical.” The anterior and posterior lips of the anus are of about equal size. Small inconspicuous somewhat pear-shaped unicellular *anal glands* can sometimes be seen, lying alongside the rectum with their narrowed necks directed toward the anus.

Tail and spinneret. The slightly arcuate *tail* is first conoid, then cylindroid in the posterior fourth, where it ends in a somewhat blunt, almost imperceptibly swollen, rounded spinneret, 73, armed only with three exceedingly inconspicuous setae, two ventrally submedian, 74, and a dorsal one, 24. Though insignificant in appearance these sensory setae are important. The very nearly symmetrical spinneret displays internally the three very slightly swollen *ampullae of the three caudal glands*, 23. The *spinneret valve*, or plug, 75, four microns across, almost at the very end of the tail, stains green with methylene blue (“intra vitam”) while other nearby parts stain blue. This *important valve* is hemispherical posteriorly and tapers anteriorly to a fine *contractile element*, shown white in the drawing, fastened in the midst of the three ampullae (23). It is by the contraction of this minute fiber that the plug or valve is pulled away from its seat, so as to permit the sticky, non-water soluble,

cement-like secretion of the three caudal glands to pour outward to be used in temporarily cementing the nema by the tail to the substratum in a versatile manner. The spinneret and associated glands are of vital importance to aquatic nemas; and this apparatus is all but universal among them. The three elongated ellipsoidal *caudal glands*, 84, 88, 90,—the remotest of them ten body-diameters in front of the anus,—are scattered in a loose tandem in the ventral part of the body cavity. Their ducts, 18, 86, leading to the spinneret, can be distinctly seen under some circumstances. Most of the caudal setae on the female are reduced and inconspicuous.

It is the sticky nature of the secretion of the caudal glands that enables these nemas to ensconce themselves so securely in the midst of the elements of the mud in which they live. By its aid they attach themselves to the substratum, especially in times of danger, and to each other. By means of this cement, they bind themselves together with mud etc. in almost inextricable tangles.

The two very thin ribbon-like lateral cords, 3, 93, of *Metoncholaimus pristiurus*, one on each side, immediately under the cuticle, are about half as wide as the body, each cord consisting of three regions,—a median region composed of a single broad row of quadrate cells, and a row, less than half as wide, on each side of it. In the anterior part of the body the quadrate cells are usually a little longer than they are broad, in the posterior part a little shorter than broad. As stated, these median cells are flanked by two much narrower longitudinal series of cells, having the same general composition, *i.e.* a very fine protoplasmic network (meshes two microns to five microns) in the inter-

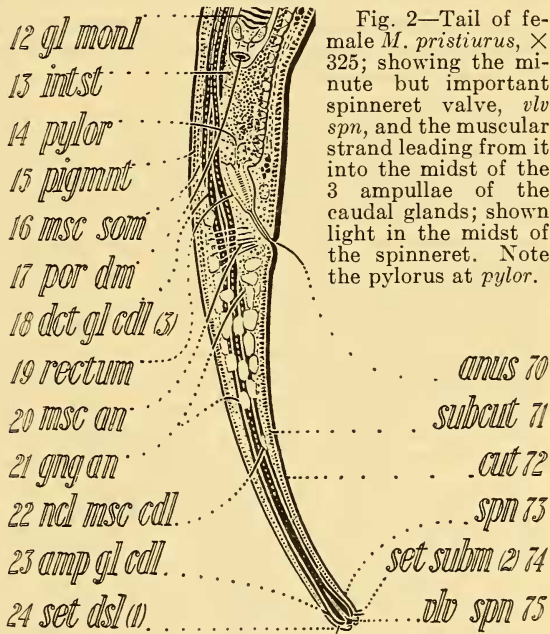


Fig. 2—Tail of female *M. pristiurus*, X 325; showing the minute but important spinneret valve, *vlv spn*, and the muscular strand leading from it into the midst of the 3 ampullae of the caudal glands; shown light in the midst of the spinneret. Note the pylorus at *pylor*.

sections of which are roundish or somewhat ellipsoidal yellowish granules, usually not equidiametral. Even without staining, there are also to be seen, at least in each of the cells composing the central row of the lateral cord, faint indications of a nucleus; these indications in the living nema consist in an almost entire absence of the reticulation which is to be found elsewhere in the cell. These cells of the lateral cord are necessarily very flat; that is to say, their depth (radially to the nema) is much less than their diameter in either of the other two directions,—*i.e.* longitudinally to the nema or tangentially. The division line between the central row of cells and the narrower ones on the margin is an almost invisible, very thin, somewhat indirect cell-wall line. Around the outer margins of the two outer rows of cells the granules are slightly *differentiated* from the other granules; so that in

seawater-methylene-blue the subcuticular pigment granules on the *borders of the longitudinal bands*, already described in connection with the *cuticle*, may stain green at a time when the rest of the granules stain blue. This appearance is similar to what is now being described for the unstained nema; so that the structure of the lateral cords is now shown to be in harmony with that of the longitudinal bands of subcuticular pigment. In other words, the arrangement of the pigment granules of the cuticle is doubtless in some way correlated with the arrangement of the cells in the lateral cords beneath. The protoplasmic network in the cells of the lateral cords is considerably finer than the protoplasmic network in the outer part of the cells composing the intestine, but nevertheless, has the same general appearance. The lacunae among the strands of the network are of variable size, more or less equidiametral, though never exactly so;—polygonal, but not regularly so. The lateral cords are wellsprings of the cuticle.

The granules of the subcuticle, 34, 82, 95, differ from the yellowish granules contained in the network of the cells of the lateral cord; in the specimen under examination the granules in the subcuticle (a little under one micron) are more nearly colorless and are round, whereas those in the lateral cord are yellowish, and somewhat irregular in size and form.

Renette and excretory pore. The *excretory pore*, 58, is located about one-fourth the distance to the nerve-ring on the ventral side of the neck. The *nucleated single renette cell*, 68, about four body-widths behind the neck, is a fusiform, granular, ventrad cell, about twice as long as wide, and nearly two-thirds as long as the corresponding body diameter; the *renette duct*, 60, 67, leads from it, somewhat meanderingly, forward to the excretory pore, and is readily seen, as a rule,—or at least some of it is. It is a slender tube about one-twentieth as wide as the neck and ends anteriorly in a small ellipsoidal *ampulla*, near 58, nearly one-third as long as the neck is wide, emptying outward through the ventral *excretory pore* in the cuticle by means of an exceedingly narrow duct only three to four microns long. The excretory secretion of this gland, as seen in its duct, and ampulla, is granular, the uniform, spherical, colorless granules being about one micron in diameter. This entire apparatus, the *renette*, is regarded as excretory in function.

Nervous system. An important part of the central nervous system is the *nerve-ring*, 38, about ten microns wide, surrounding the oesophagus somewhat obliquely in front of the middle. It consists of a compact network, or skein, of exceedingly fine nerve fibers. Before and behind the nerve-ring are scores of distinct nucleated *ganglion cells*, 11, 56, *etc.*, mostly bipolar, those in front being arranged in eight obscure longitudinal groups,—two lateral, one ventral, one dorsal, and four submedian. The ganglion cells are variously connected with each other and with the nerve-ring. Placing the nema over night in seawater-methylene-blue discloses some of the elements of the *ventral nerve* leading from the nerve-ring along the ventral line to the tail. Usually about 128 fusiform elements in the ventral series may be disclosed (stained blue) in this way. These can be proved to be connected with each other. The same treatment is likely also to reveal the nerve elements entering the bases of setae, and papillae, especially in the tail of the male. See Fig. 4.

Female organs. From the slightly elevated *vulva*, 7, which is a transverse ventral slit of moderate size, the medium sized *vagina* leads inward and slightly forward about halfway across the body; the vagina is somewhat cuticularized and is accompanied by small and very inconspicuous *vaginal glands*, 9, fore and aft. About two dozen *radiating muscles*, 6, occur around the

vulva, together with an associated complicated nerve plexus. This musculature is least developed behind the vulva.

The straight *uterus*, 30, 8, extends forward, and is of such capacity as to accommodate a maximum of about forty *eggs*, 10, 39, (i.e., many more than shown in this drawing) arranged approximately single file,—although this large number of eggs is rarely seen except toward autumn. Under such circumstances the oblate eggs, seeming to nearly fill the body cavity in this region, are more or less ellipsoidal in contour and half a body-width long, and twice as wide as long. When deposited, or when not crowded in the uterus, the eggs are ellipsoidal and longer than wide. The *shells* of the eggs, one and a half microns thick, are smooth, and the eggs are deposited *before segmentation* begins. Naturally, the length of the uterus varies according to the number of eggs it contains.

The broad *reflexed ovary* appears more or less cylindroid, and when there are, say, a dozen eggs in the uterus, the terminus of the ovary, 59, lies about halfway back to the vulva. The narrow *oviduct*, 46, 52, leading from the front end of the ovary back to the uterus, is usually nearly invisible, but when a ripe ovum, 50, having passed round the bend (flexure) near 46, is being forced backward through it from the front part of the ovary back to the uterus, its presence is obvious. It is faintly visible at 52. The ova are fertilized on first reaching the uterus, and soon after this it is not very uncommon to witness the early stages of the formation (*mit.*, Fig. 1) of the *polar bodies*,—which appear later as small spherical bodies just under the eggshell. A small collection of sperms is seen in the spermathecal region at 61.

The demanian system. In the adult female of *Metoncholaimus pristiurus* there is a complicated double *system of efferent tubes*, the *demanian vessels*, connecting, first, with the posterior part of the intestine through an *osmosium*, 87, and second, with the posterior end of the uterus by means of a very long slender efferent duct, 79, 85. These two efferents join at a conspicuous thirty-two-merous, special glandular gateway,—the *wette*, 40,—and empty, by way of the *wette* pore, 62, thence backward and outward through two separate narrow lateral ducts, 42, having attached to them, *along their outer sides*, relatively large and long conspicuous *moniliform affluent glands*, 64, seventeen microns wide, each consisting usually of sixty-four somewhat discoid elements, 66,—occasionally double (?) this number. These discoid cells of the two moniliform glands are three microns thick and packed with granules of the order of one micron; the flat ducts, along the inside of the moniliform glands, lead to two *exit pores*, the right hand one shown at 17, five by seven microns, laterad in the body wall one-half tail-length in front of the anus. However, the caudad elements of the moniliform glands are “pyriform,” as shown in the illustration,—not discoid. The demanian vessels elaborate a *copious, elastic, sticky, non-water-soluble, nearly colorless secretion*, possibly utilized during agglomeration and copulation, and also mayhap to protect and preserve the batches of eggs after deposition and during segmentation.

The *uvette*, 40, is a very striking organ consisting of thirty-two concentrically arranged, highly refractive, flask-shaped, glandular elements, all concentric about a single *minute central pore*, 62, leading into the large duct passing backward and dividing to form the two lateral efferent ducts each accompanied by a sixty-four-fold moniliform gland, as already described. The connection of the intestine with the demanian system at the osmosium is *not an open one*; the nature of the connection with the uterus, however, appears less certain.

The osmosium, 87, of the enteric efferent is located about one-third the distance from the anus to the vulva, and may usually be seen on the dorsal side of the intestine,—being mainly visible on account of the somewhat greater transparency of its tissues. The narrow uterine efferent duct, *ut. eff.*, 79, 85, is very difficult to follow throughout its length, and usually can be seen only in specially favorable specimens. Its connection with the posterior end of the uterus is sometimes easy to see,—near 30. Its connection with the uvette is also nearly always easy to see, and it may be followed thence forward a short distance, but to trace it far is usually a matter of some difficulty.

The thirty-two flask-shaped elements of the uvette have their *necks* concentrated at the pore. The wall of the uterine duct, as previously described, spreads out over the uvette, and beneath it the thirty-two elements form a craterlike affair leading to the uvette pore. This pore opens into the somewhat duplex (but really monoluminal) corridor of the caudad part of the intestinal efferent. This latter efferent may show signs of forking at a distance in front of the uvette about equal to the corresponding body diameter, but is seldom, if ever, really bifurcate until behind the uvette.

Or,—*following the demanian system from the rear toward the uvette*:—Where the moniliform glands approach the uvette, they join to form a two-fold structure, and the pore of the uvette is placed between the two parts of this double structure. The structure of the *tunic* of the demanian system opposite the uvette presents two sets of exceedingly fine symmetrically arranged elements,—one sloping 45° right, the other left,—which continue forward. This “spiral” structure can be seen throughout the duplex portion of the demanian system now being described, namely that portion in the vicinity of the uvette.

Sperms, 61, are to be seen at the cephalad end of the uterus *i.e.*, the *spermatheca*, where the oviduct joins the uterus, sometimes in a mass comprising scores of sperms, each about one-tenth as wide as the corresponding portion of the body. They are rather difficult to see except when they are present in considerable numbers.

MALE. Fig. 3.

The spicula and other male organs. $\frac{0.8}{0.8}$ $\frac{5.3}{1.2}$ $\frac{11}{1.5}$ $\frac{93}{1.5}$ $\frac{96}{0.7}$ $\frac{5.6}{0.7}$ mm

The tail of the male is more or less like that of the female in form, but is somewhat larger, more arcuate, and *far more flexible*, even prehensile, as Fig. 2 indicates. It diminishes a little more suddenly in size at the anus, and is armed with special setae and papillae. The two, equal, colorless, long and very slender, uniform *spicula*, 57, 58, seven times as long as the anal body diameter, are almost imperceptibly cephalated by expansion. They are simple and frail looking, their proximal ends lying more or less opposite the body axis. A long slender, duplex, nucleated *retractor muscle*, 16, extends forward from the proximal end of each spiculum to the body-wall in the corresponding subdorsal region, near 12; an antagonistic *protrusor muscle*, of about equal size *ensheaths* each spiculum. The small *inconspicuous gubernaculum*, 42, lying near the anus, is *double* and straight. Its two equal parts are somewhat frail and simple, but are expanded internally so as to be visible. They are only about half as long as the anal body diameter, and lie against the tips of the spicula in such a way that their swollen and more visible proximal ends, 42, lie nearly opposite the axis of the base of the tail.

There is a single inconspicuous *preanal ventral papilla*, 22, very close to the anus, 21, but readily seen when searched for. There are about ten small